

MAR665: Homework#2

Consider solving the one-dimensional advection equation

$$\frac{\partial \phi}{\partial t} + c \frac{\partial \phi}{\partial x} = 0$$

using the Lax-Wendroff scheme,

$$\frac{\phi_i^{n+1} - \phi_i^n}{\Delta t} + \frac{c}{2\Delta x}(\phi_{i+1}^n - \phi_{i-1}^n) - \frac{c^2 \Delta t}{2\Delta x^2}(\phi_{i+1}^n - 2\phi_i^n + \phi_{i-1}^n) = 0 .$$

- a) Examine the truncation error to determine the order of the scheme in time and space.
- b) Determine the conditions for absolute stability and explain heuristically how Lax-Wendroff cures the forward time/centered space stability problem.